Approaches to the Analysis of Production Activity at Archaeological Sites

edited by

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Preface

Anna K. Hodgkinson and Cecilie Lelek Tvetmarken

This volume contains the proceedings of a workshop entitled '*Approaches in the Analysis of Production at Archaeological Sites*', which took place at the Topoi-House in Berlin-Dahlem on 21–22 January 2018. The workshop was the final deliverable of a Marie Skłodowska-Curie Actions Individual (postdoctoral) Fellowship awarded to one of the editors, Anna Hodgkinson, for a project that took place between October 2015 and September 2017.[1] The research project was entitled '*Glass, Faience and Food in Late Bronze Age Societies: An Analysis of the Socio-Economics of Urban Industries in Egyptian and Mesopotamian settlements*', or GLASS.[2] The editors are grateful to the European Commission for financing this workshop and thus making this exchange possible. The publication of this volume has been made possible by generous financial assistance from the *Ernst-Reuter-Gesellschaft der Freunde, Förderer und Ehemaligen der Freien Universität Berlin e.V.* and the Open Access Publication Fund of the Freie Universität Berlin.

The workshop was planned in order to facilitate the exchange of experiences of, and methodologies applied by researchers involved in the analysis of archaeological remains of production activities and papers were presented by doctoral students, early career researchers as well as established scholars. The papers presented at the workshop covered a wide range of industries and manufacturing processes from several geographical regions, including material from both archaeological sites and museum collections, and from a variety of dates. In total, 16 papers were presented, including a keynote presentation on the evening of the first day, which was delivered by Prof. Cathy L. Costin (Professor of Anthropology at California State University) on the topic of *'Locating Craft Production: Space and Place'*.[3] Prof. Costin is renowned for her theoretical and anthropological work on archaeological production activities, and we are very grateful for her contribution to both the workshop and this volume. Participants presented and discussed a wide range of diverse methods employed in the analysis of several sites and their industries, covering topics such as the identification of household-level manufacture, the organisation of production, the identification and analysis of production remains, the procurement and processing of raw materials, and the people involved in the production activities and their gestures. Presentations were grouped into sessions according to material category, i.e. pottery production, glass and glazes, and stone- and bone tools and quarries, with one session focusing on case studies concerned with the organisation of various types of production involving a range of materials (e.g. household and institutionalised production). The variety of topics, the range of ancient industries, and approaches and methods presented at the workshop sparked lively debate amongst the participants. The editors are grateful to all participants for contributing to this diverse workshop and its discussions, and to the chairpersons for moderating the individual sessions, as well as to those that contributed a chapter for this volume.

While the scope of some of the contributions differ from what was presented at the workshop (for various reasons), the general focus of the individual papers remains the same. Some of the individual chapters present new, unpublished data or a first English-language presentation of the same. Other papers provide comprehensive reviews of the application of particular methods or overviews of the evidence available pertaining to a particular industry as well as reinterpretations of existing data on specific topics.

The editors would like to thank Dr David Davison, Patrick Harris, Dr Vendi Jukic Buca and Danko Josić from Archaeopress for their assistance and guidance throughout the publication process of this volume. We are also thankful to the anonymous peer reviewers for their detailed comments towards the individual papers. Our sincerest thanks are also due to Jan Picton and Alan Hodgkinson for their help copy-editing and proofreading parts of this publication.

Further thanks are extended to Prof. Michael Meyer, director of the Excellence Cluster Topoi, who not only granted his permission to carry out this workshop

[1] The fellowship was awarded through the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement no.: 653188.

[2] See http://www.topoi.org/project/a-6-cofund-1/ (viewed on 5 January 2020).

[3] Please refer to http://www.topoi.org/event/43029/ for the full workshop programme and https://www.annahodgkinson.co.uk/20180120_AnalysisOfProduction_Abstracts.pdf (viewed on 5 January 2020) for the abstract booklet.

on the premises of Topoi in Berlin-Dahlem, but also welcomed the above-mentioned project, GLASS, into the research group 'A-6: Economic Space at Topoi'. The editors are grateful to the staff at Topoi and Freie Universität Berlin, who helped make the workshop possible. Angela Böhme, the secretary of the Institute of Egyptology, played a key role in organising the catering and various administrative aspects in connection with both the workshop and this publication. Furthermore, Birgit Nennstiel shall be thanked for the design of the posters, the programme and abstract booklet, and the website. Elisabeth Kanarachou has been helpful in logistical matters concerning the workshop location. Last, but not least, the editors would like to thank all volunteers and the caterers without whom the event would not have been able to take place.

1. Introduction

Anna K. Hodgkinson and Cecilie Lelek Tvetmarken

Many of the things that humans use and consume in their everyday life have at some point been altered to suit a particular purpose, whether functional or aesthetic. Thus, production is ubiquitous and occurs in all segments of society and within a broad variety of social settings. Consequently, production is not restricted to any particular spatial or societal confines, nor does it occur only on a particular scale. It includes everything from domestic activities, such as those considered 'mundane' (e.g. food preparation), to mass-production on an industrial scale. Many of these activities leave traces in the archaeological record, forming the focal point of much archaeological research. Manufacturing activities were the central aspect explored in this workshop, which was planned in order to enable researchers involved in archaeological, archaeometric and other related disciplines to exchange their experiences of analysing production activity at archaeological sites. Regardless of time, culture or type of manufacturing activity, the structural and related artefactual and, if available, textual remains associated with production can provide us with a large amount of information concerning various aspects of the workflow, or *chaîne opératoire* of production and the spatial settings of such activities. Additionally, such remains provide us with an insight into socio-economic aspects, such as the organisation of manufacturing activities and the control of resources and finished goods.

Traditional research on ancient production activities, as conducted in the early 20th century, was largely concerned with a culture historical approach. Although research output from this period varies depending on discipline, culture and geographical context, it frequently adopted a typological approach, through which archaeological objects were mainly classified according to optical features.[1] These features were used by archaeologists and anthropologists to assign dates and functions to objects, and this typological classification formed the basis of evidence through which cultures were identified within the archaeological record.[2]

This general approach opened the way for the so-called processual archaeologists in the 1950s and 1960s, who sought to expand the scope of archaeological enquiries beyond the mostly stylistic and functional focus of past research.[3] Their main criticism of previous approaches centred on what they perceived to be the arbitrary classifications of objects based on artificial groups of diagnostic criteria.[4] Instead, they endeavoured to understand 'how' and 'why' an object had been made and used. A systems-based way of thinking and interpretation developed during this era, led by scholars such as Lewis R. Binford, who developed the so-called 'Middle-Range Theory',[5] which aimed to create a link between 'static' archaeological objects and past dynamics.[6] Binford himself combined his theory with ethnographic observations in order to understand patterns of human behaviour.[7] In addition to introducing a wider array of concepts and broadening the focus of archaeological enquiries, this era also saw the use of new technologies, such as spatial and chemical analysis, to understand the composition of archaeological objects and to gather information on the organisation and control of manufacture and labour.

The 1970s and 1980s saw an increased dissatisfaction with a number of approaches and theoretical concerns advocated by processual archaeologists, such as their apparent lack of objectivity and the creation of extremely large datasets.[8] A notable proponent of this criticism, which became known as post-processual archaeology, is Ian Hodder. He and others argued that there should be greater focus on the concept of 'human agency', i.e. the capacity of individuals to act and make decisions on their own behalf.[9] Post-processual archaeology incorporated a great variety of approaches

[1] Johnson (2010: 18–19).

[2] See Caldwell (1959: 303–304); Rouse (1960) and references therein. See also Adams and Adams (1991: 99–142) and Petrie (1901: 1–12) for typological case studies, William Matthew Flinders Petrie being one of the first scholars to use this method, having developed a typology for the sequence dating of predynastic and early dynastic Egyptian pottery.

[3] Although it should be noted that this dissatisfaction with culture-historical approaches had started before the explicit formulation of the approaches advocated within the so-called processual archaeology (see, e.g., Tallgrenn 1937; as well as Trigger 1989 and references therein).

[4] See, e.g., Binford (1964: 433); Caldwell (1959); Dunnell (1986: 152).

[5] 'Middle Range Theory' was originally developed by Robert K. Merton for the field of sociology (see Cole 2004).

[6] E.g. Binford (1962; 1981); see also Costin in this volume.

[7] See Johnson (2010: 51).

[8] See Johnson (2010: 56).

[9] Bernbeck (1997: 311–314); Hodder (1985; 1995: 74); Johnson (2010: 108–109).

(such as gender studies and phenomenology), which were also applied to the analysis of production and the organisation thereof. It was during these years, more specifically in the late 1970s, that the concept of the *chaîne opératoire* was developed by André Leroi-Gourhan for the study of lithics. This concept comprises numerous steps, ranging from the procurement and manipulation of raw materials to the use, reuse and discard of the finished product, and has been defined by Frédéric Sellet as follows: 'Consequently, the *chaîne opératoire* aims to describe and understand all cultural transformations that a specific raw material had to go through. It is a chronological segmentation of the actions and mental processes required in the manufacture of an artifact and in its maintenance into the technical system of a prehistoric group. The initial stage of the chain is raw material procurement, and the final stage is the discard of the artifact.'[10]

This *chaîne opératoire* approach has subsequently been adapted by a number of scholars, including Marcia-Anne Dobres,[11] Heather-Louise Miller[12] and Cathy Costin, whose work has focused on the analysis and identification of craft production, the procedures and individuals involved in the processes (human agency), and the organisation thereof. Miller, for example, defines the organisation of production as 'the organizational arrangement within which production takes place. This may refer to one artisan working on an object from start to finish, or it may refer to a system of specialist workers, managers, and materials procurers'.[13] In a similar vein, Dobres and Costin have argued for the necessity of considering the actors involved in production activities, bearing in mind that these were subject to social, cultural and natural circumstances, while also making their own decisions.[14] Dobres has, furthermore, argued in favour of the concurrent use of scientific archaeometric approaches, since these may provide information on 'technical gestures and related strategic choices of artifact manufacture, use and repair'.[15] Similarly, using both archaeological and ethnographic data from the Andean region, Costin has created a theoretical framework for the classification of production systems according to the level of specialisation observable in the archaeological, textual and ethnographic record. By taking into account such factors as skills and gender-specific roles in the manufacture of a certain type of product, Costin created a classification of workshops at settlements and other sites, not all of which are visible in the archaeological record.[16] This classification has been and is being consulted and applied by a wide range of scholars working in the field of ancient industries.[17]

Production activities often leave a number of physical traces, including, but not limited to, manufacturing tools; raw materials, e.g. clay, stone or minerals; production waste, e.g. chipped stone debitage and metal slag; installations, e.g. ovens and furnaces, olive presses and grinding stones; as well as the finished products. In addition, certain types of production have a greater impact on both the natural and the built environment in which they take place; these include activities such as quarrying and the construction of agricultural terraces and large building complexes. Dennis Mario Beck, for example, in his presentation at the workshop, discussed the organisation of marble procurement and marble object production taking place at *Simitthus*/Chimtou (Tunisia) during the Iron Age. These activities resulted in both the alteration of the natural landscape ('quarryscape') and the construction of an associated built environment through the establishment of housing for the slaves in the so-called *Arbeits- und Steinbruchlager*.[18]

A number of papers also considered the spatial configuration of the built environment together with other types of evidence, such as installations and tools associated with production and other material remains, including waste products and raw materials. Macarena Bustamante-Álvarez and Albert Ribera i Lacomba, for instance, discussed the evidence of the manufacture of both perfume and wool from the House of Ariadne in the Guild District[19] in Pompeii (Italy). By analysing both artefactual and structural remains, Bustamente-Álvarez and Ribera i Lacomba were able to demonstrate that these two industries were linked; lanolin, a bi-product from the wool processing, was an essential raw material in the manufacture of perfumes.[20]

In their presentation, Chiori Kitagawa and Silvia Prell also focused on multiple strands of evidence from a workshop complex at Qantir-Piramesse (Egypt) in their reconstruction of the *chaîne opératoire* of the bone tool production. The latter appeared to be mainly concerned with the manufacture of bone points, which are assumed to be arrowheads used in weaponry. Part of

[10] Sellet (1993: 106).
[11] Dobres (2010: 107) states that 'when infused with phenomenological concerns and an explicit focus on gender and social agency, *chaîne opératoire* can also serve as a *conceptual framework* for understanding the meaningful links and chains between people and products, between artifice and artifacts, and between gestures and gadgets' (emphasis in the original).
[12] Miller (2007: 29–30).
[13] Miller (2007: 5).
[14] See, for instance, Costin (1996) on the importance of gender studies in the analysis of craft specialisation; see also Dobres (2010).
[15] Dobres (2010: 103).
[16] Costin (1991; 1996; 2005).
[17] See, for instance, Meyer *et al.* (2016: 193) and contributions by Baysal, Doherty, Govantes-Edwards *et al.* and Hodgkinson in this volume.
[18] For further information on this project, see Bebermeier *et al.* (2016: 12–14); von Rummel *et al.* (2016: 103–104).
[19] Della Corte (1965: 181–182).
[20] See Bustamante-Álvarez and Ribera i Lacomba in this volume.

their study focused on the analysis of a range of stone tools recovered from the workshop complex, which highlights their multi-functionality and use in the manufacture of a number of different items of armour and weaponry.[21]

Modern methods of investigation, including micro- or macroscopic use-wear analysis and chemical analysis of artefactual and structural remains, have provided researchers with a deeper understanding of past manufacturing processes. Unfortunately, the archaeological contexts of these materials are not always secure; occasionally researchers have to work with material remains that have been removed from their original context. Additionally, archaeological materials have sometimes been excavated a long time ago, often with less than ideal contextual documentation. In these cases, modern methods of investigation have increasingly enabled researchers to acquire previously inaccessible information about the manufacturing processes.

In her presentation, Stephanie Boonstra, for example, outlined the problems related to the identification of actual scarab workshops, one major point being the fact that scarabs are small and portable, having often travelled far distances. In addition, the identification of physical remains associated with their production, i.e. materials, tools and installations, is very difficult, since these were not always exclusively used for scarab manufacture. Based on typological and technological characteristics, Boonstra has succeeded in identifying a number of 'typological' scarab workshops, the physical locations of which have not been established. Boonstra, furthermore, outlined how the survival of physical scarab workshops can help locate 'typological' workshops.[22]

Other studies presented at the workshop showed how data from old excavations might yield new information when combined with the results from more recent excavations employing a range of modern excavation, sampling and analytical techniques. Johanna Sigl presented a number of such new methods implemented as part of the 'Realities of Life' project at the settlement site of Elephantine, which the German Archaeological Institute (DAI) has been excavating since 1969. This new project focuses on the excavation of houses dating to the Middle Kingdom; in particular, it aims to identify evidence of food production, living spaces and trade activities. In her paper, Sigl showed that the introduction of a more detailed and rigorous sampling and collection strategy has enabled the team to recover and document a range of microarchaeological material previously not extensively recognised at the site. This, and other data, has also permitted the team to identify spaces used for domestic bread production and mud brick manufacture, as well the production of jewellery from semi-precious stones.[23]

Sebastian Olschok presented his work in the economic complex of the monastery of Deir Anba Hadra (Egypt), outlining the problems associated with data from excavations carried out in the 1920s. He demonstrated how the redocumentation of architectural remains using modern methods (e.g. structure-from-motion) in combination with results from recent excavation allowed a more in-depth analysis of the structuring and use of space and how it changed through time, focusing on structures and installations associated with production activities, including food, oil and ceramics.[24]

Similarly, Anna Hodgkinson, in her presentation, pointed out the issues associated with the use of old excavation data when carrying out spatial analyses (using GIS) of production activities at archaeological sites, as well as the fact that certain types of evidence may not have been detected during old excavations. Carrying out excavations at Amarna (Egypt) utilising a range of modern techniques, enabled Hodgkinson to obtain a more detailed and complete dataset than documented by the previous excavations.[25] Hodgkinson also showed that the on-site use of portable equipment for chemical analysis, such as portable X-ray fluorescence (pXRF), permitted her to gain information on the composition of glass objects that would otherwise be difficult due to the Egyptian Antiquities Law.[26]

In their presentation, Dirk Paul Mielke and Sonja Behrendt used a multi-method archaeometric approach in order to identify otherwise archaeologically unidentifiable centres of Phoenician pottery production on the Iberian Peninsula and in the Western Mediterranean during the first half of the 1st millennium BC. By applying a combination of pXRF and static, laboratory-based neutron activation analysis (NAA), as well as more traditional techniques (e.g. analysis of vessel shapes and wares), they were able to analyse a great number of pottery sherds from a variety of locations. Acknowledging that there are some issues related to the use of less precise portable technology, Mielke and Behrendt were, nevertheless, able to show how the statistical analysis and interpretation of this data has led to a new understanding of production centres and exchange networks in this region.[27]

Another multi-method archaeometric approach was presented by Ki Suk Park and co-authors, Ralf Milke and

[21] See Prell and Kitagawa in this volume.
[22] See Boonstra in this volume.
[23] See Sigl and Kopp in this volume.
[24] See Olschok (n.d.) for further information.
[25] See Hodgkinson in this volume.
[26] Hodgkinson *et al.* (2019).
[27] See Behrendt and Mielke (2011); Behrendt *et al.* (2012).

Sabine Reinhold, who used methods such as thin-section petrography, chemical analysis and Fourier-transform infrared spectroscopy (FT-IR) in reflectance mode to analyse the mineralogical and chemical composition of Late Bronze Age ceramic vessels from the North Caucasus (Russia) in order to gain information on the makeup of the ceramic material. This, in turn, has not only provided insight into the geological conditions of the raw material sources, but has also given clues on the *chaîne opératoire* used in the ceramics workshops, including firing temperatures and firing conditions.[28]

Similarly, Carmen Ting and Jane Humphris used a combination of macroscopic and microscopic archaeometrical methods (thin-section petrography and scanning electron microscopy with energy dispersive X-Ray spectroscopy: SEM-EDS) in their investigation of ceramic assemblages dating to the Napatan, Meroitic and post-Meroitic periods from the sites of Meroe and Hamadab (Sudan). By analysing the microstructure of both domestic and technical ceramics recovered from slag heaps at these sites, Ting and Humphris were able to obtain insights into various aspects of ceramics production, such as the standardisation of clay preparation and products, leading to a broader picture of the organisation of pottery production and how it changed over time.[29]

A new application for pXRF technology was presented by Chloë N. Duckworth, who, together with her co-authors, Eleonora Montanari and Derek Pitman, has developed a technique for conducting *in situ* chemical soil mapping during excavation. By analysing a number of areas possibly used for the production of glass at the Medieval sites of the Alhambra and Medinet Zahra (Spain), they were able to detect concentrations of industry-specific chemicals, thus gaining an insight into the use of space and areas selected for production. Furthermore, they highlighted the advantages of this portable method in gathering large amounts of data over a short period of time while in the field, thus enabling the efficient selection of areas for excavation.[30]

Another avenue of research into ancient technologies is experimental archaeology. The main focus of this is the recreation and reconstruction of past methods and conditions of manufacturing activities based on various types of evidence, including archaeological and textual remains, as well as ethnographic data. Importantly, experimental archaeology does not prove that the tested processes were carried out in a particular way or using particular resources. Nevertheless, it can still help us gain a deeper understanding of the requirements and logistics necessary for the manufacture of goods, especially in those cases where precise archaeological evidence or diagnostic finds are missing. In addition, it can provide information on the invisible aspects of production, such as the use of open spaces, and people involved in the manufacturing activities, as well as the evolution of secondary evidence, including the effect of production activity on the human skeleton.[31]

Frank Wiesenberg, for example, presented the results of a range of archaeological experiments undertaken at the Archaeological Park Roman Villa Borg (Germany), the Provinciaal Archaeologisch Museum Velzeke (Belgium) and in Quarley (England) in order to better understand the functionality and construction of Roman glass furnaces. These experiments highlighted several issues associated with previous interpretations of the surviving archaeological remains of these types of firing structures, in addition to demonstrating that not all industrial firing activities leave a recognisable trace in the archaeological record. Wiesenberg concluded that experimentation can provide valuable information on logistical and technical aspects of Roman glass workshops.[32]

Similarly, Sarah Doherty outlined the information she was able to gain through her experimental archaeological work, which also included ethnographic observations, on Egyptian ceramic production, with a particular focus on the organisation of pottery workshops. In her presentation, Doherty embedded her experimental approach in a broader research framework that included an examination of the archaeological, textual and pictographic evidence of pottery production in Ancient Egypt.[33]

Understanding the organisation and processes involved in production activities provides us with a basis from which we can start to reconstruct many socio-economic aspects of past societies and how they developed through time. This includes the organisation of, and hierarchy involved in various types of production, be it pottery manufacture, stone working, food production, metallurgy or the manufacture of vitreous materials. It also enables us to identify levels of specialisation and skills, the degree of control of production and raw materials involved. The study of the circulation of goods makes it possible for us to reconstruct distribution or exchange networks and to identify which products were in demand. All of this makes possible the identification

[28] See Park *et al.* (2019).
[29] See Ting and Humphris in this volume.
[30] See Duckworth (2017).
[31] Ruff (2008: 184). See Dabbs *et al.* (2015: 36–40) for a bioarchaeological assessment of skeletal remains excavated at the South Tombs Cemetery at Tell el-Amarna (Egypt). Many of these skeletons show signs of malnutrition as well as stress- and trauma-related deformation derived from hard labour. See, e.g., Molleson (2007) for a study of non-traumatic task-related morphologies in the skeletal population caused by routine work undertaken since childhood at the Neolithic site of Abu Hureyra (Syria).
[32] See Wiesenberg in this volume.
[33] See Doherty in this volume.

of various scales of production, including mass-production, elite or royal control of technologies and raw materials, and less regulated domestic networks of production.

For example, in their presentation, David J. Govantes-Edwards, together with co-authors Chloë N. Duckworth, Amaya Gómez de la Torre and Lauro Olmo, demonstrated that the location of certain industries can provide valuable information on the socio-economic status of this industry. Focusing on a number of Visigothic sites in Spain, they argued that the location of glass production in close proximity to palatial complexes from the 6th century AD onward was a symbolic way for the ruler to demonstrate his power over raw materials and glass technology as it was considered bothersome since it involved the use of noisy and pungent furnaces.[34]

Every industrial and manufacturing activity produces a different set of archaeological evidence, some of which may not survive in the archaeological record (e.g. organic materials). In addition, certain steps or decisions taken in, or the organisation of past manufacturing processes will not be identifiable to archaeologists, especially those conveyed through oral tradition. This applies in particular, although it is not limited to, cultures without a written language. Even if this kind of information does not leave a physical trace in the archaeological record and may not have contributed to the end product, being purely ritual in character, it may have played as important a role in the manufacturing process as, for example, the adding of raw materials or the wielding of certain tools. For example, the production of glass in the Neo-Assyrian Period, more specifically the reign of Assurbanipal (668–627 BC), as documented on a series of cuneiform tablets, involved the recital of incantations at certain stages in the production process.[35] Although this information would not provide data on the physical aspects of this process or the finished objects, it can still supply us with valuable insights into the social context, organisation and traditions surrounding various industrial activities.

Similarly, it is not always possible to identify the physical location in which manufacturing activities took place, as pointed out by both Cathy Costin and Adnan Baysal during the workshop. Costin, for example, conducted an ethnographic study of textile production in the modern Andean region, documenting how women still carry out spinning and weaving tasks while walking and conducting everyday activities. Since spinning takes place wherever the weaver goes, it would be difficult to pinpoint the actual production spaces and places were we to look for them in the archaeological record. Applying the concepts of 'flowscape' (the movement of matter and materials through the landscape) and 'taskscape' (based on interactivity, agency and choice)[36] in a discussion of the organisation of textile manufacture in the Inka Empire, Costin, in her keynote lecture, highlighted the importance of distinguishing between 'space' (abstract) and 'place' (distinctive and meaningful).

Reflecting on theoretical approaches concerned with production and *chaîne opératoire*, Baysal questioned archaeologists' understanding of the concept of production places and spaces. Baysal pointed out that the concept of *chaîne opératoire* should not necessarily be understood as linear. Using the example of portable ground stone tools used for grinding, he highlighted the fact that products can themselves become places of production and that these places are often not static and may move according to a variety of factors, including personal choice, environmental conditions and so on.[37]

Costin has, for this volume, produced a theoretical discussion of the term 'workshop' based on a lively discourse among the participants during the final roundtable discussion at the event. The resulting paper comprises a literature review of various archaeological and ethnographic studies on the topic of ancient modes of production. In her contribution, Costin questions common assumptions and presumptions regarding a variety of aspects and issues of ancient productivity, including the organisation of labour, craft specialisation and standardisation, the actors involved in production (e.g. gender, identity and family relationships) and the use of tools and space in a workshop. Costin argues that craft specialisation and organisation of labour in the ancient world was much more varied than conveyed by individual authors, and that many of these aspects of production cannot, or can only partially, be observed in the archaeological record. Based on her critique, she suggests some best-practice approaches for future discussions of craft production, such as a move away from a rigid and narrow definition of the term 'workshop'. Instead, Costin suggests that scholars should use the term together with descriptive modifiers (e.g. 'domestic', 'palatial', etc.), which would provide a better framework for the analysis of ancient production activities within their broader contexts.[38]

One important issue that the papers included in this volume have demonstrated is that we need to approach production from a variety of angles, using a variety of

[34] See Govantes-Edwards *et al.* in this volume.
[35] Thompson (1925) has analysed and described the chemical processes described in the Assyrian cuneiform glass texts. See Oppenheim (1970) and Shortland (2008) for more detailed analyses of this text category.
[36] Ingold (1993).
[37] See Baysal in this volume.
[38] See Costin in this volume.

approaches and analytical methods in order to gain a better understanding of these. We also need to be clear in how we use specific terminology, specifically where no precise definitions exist, or where definitions may be subject to cultural and historical bias.

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